UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,950	08/02/2006	Kouichi Yamaguchi	060558	6636

23850 7590 01/14/2009
KRATZ, QUINTOS & HANSON, LLP
1420 K Street, N.W.
Suite 400
WASHINGTON, DC 20005

EXAMINER	
NGUYEN, VU ANH	
ART UNIT	**PAPER NUMBER**
1796	

MAIL DATE	DELIVERY MODE
01/14/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/587,950	Applicant(s) YAMAGUCHI ET AL.	
	Examiner Vu Nguyen	Art Unit 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _08 December 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1,3-7,9-15 and 17_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1,3-7,9-15 and 17_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _12/08/2008_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office action is in response to the amendment filed 12/08/2008. Claims 1, 15 and 17 have been amended. Claims 2, 8, 16, and 18 have been cancelled. No new claims have been added. Claims 1, 3-7, 9-15, and 17 are pending.

Information Disclosure Statement

2. Acknowledgment is made of the Information Disclosure Statement filed 12/08/2008. The information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1, 3-7, 9-15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glatkowski et al. (US 2003/0008123 A1) in view of Matsui et al. (WO 2000/40509) and Nishino et al. (US 2003/0175462 A1). *Notes: US Pat. 6,960,334 B1 is being relied upon as English equivalent of WO 2000/40509).*

6. Regarding the limitations set forth in these claims, Glatkowski et al. (Glatkowski, hereafter) teaches a nanocomposite dielectric comprising a polymer matrix and a plurality of carbon nanotubes (CNTs) dispersed therein (Claim 1). The amount of the carbon nanotubes is inherently between 0.0001 and 0.04 wt% relative to the resin (Figure 3; [0084] & [0107]). The polymer matrix is selected from a group that comprises epoxy resins, polyimides, fluoropolymers, urethanes, polycarbonate, polyolefin resins, and combinations thereof [0057]. It is to be noted that resins such as epoxy resins, polyimides, and urethanes are curable resins. The carbon nanotubes include single-walled (CNTs), multi-walled CNTs, or mixture thereof (Claims 2-4). Also disclosed is a mobile antenna comprising said nanocomposite dielectric [0076]. It is well known that antennas for mobile phones, GPS, and bluetooth communications systems [0075] operate in the GHz frequency ranges (see also Figure 2 and [0093]). The disclosed nanocomposite dielectric has a dielectric loss less than 0.02 (Claim 20) and the small amount of the CNTs does not have a negative impact on the intrinsic properties of the polymer matrix [0055]. A method of minimizing dielectric loss is taught by way of preparing the disclosed nanocomposite dielectric [0068].

7. Clearly, Glatkowski teaches all the limitations set forth in these claims <u>but fails to teach the carbon nanotubes recited in claims 1, 15, and 17 and the resin in claim 6.</u>

8. Matsui et al. (Matsui, hereafter) teaches a method of manufacturing amorphous nanoscale carbon tubes wherein the CNTs have the structure as recited in claim 3 (col. 3, lines 35-40). **[Motivations]** The disclosed amorphous CNTs are said to be durable for repetitive use and possess excellent mechanical, electronic, and chemical properties; and the disclosed method is said to allow mass production, in high yield and high purity, of the amorphous CNTs and enables the control of the structure and shape of the CNTs at nanoscale (col. 2, lines 17-39).

9. Nishino et al. (Nishino, hereafter) discloses “an iron-carbon composite in which 10 to 90% of the internal space of a nanoflake carbon tube or a nested multi-walled carbon nanotube is filled with iron carbide or iron” (Abstract). **[Motivations]** Nishino also teaches that the disclosed composite can be synthesized in large quantities [0104], possesses excellent durability [0163], and, when a small amount of which is added to a resin, increases electrical conductivity and mechanical strength of the resulting articles without giving a negative impact on the transparency , hue and so forth of the resin [0166-0168]. Another important advantage of the disclosed composite is that, while the electrical properties of normal (unfilled) CNTs are dictated by the structure of the walls and controlling said structure poses a significant challenge, the electrical properties of disclosed iron-filled CNTs are dictated by the contained metal rather than by the carbon wall structure and, therefore, controlling those properties is made easier [0164-0165].

10. In light of the teachings of Matsui and Nishino, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have also included the carbon nanotubes taught by Matsui and Nishino in the nanocomposite

dielectric taught by Glatkowski so as to lower the overall cost, improve the durability of the final products, and attain better control of the structure and properties of the CNTs, which, in turn, enables greater control on the properties of the nanocomposite dielectric made with such CNTs.

11. With respect to the resin recited in claim 6, the disclosed polymer matrix “comprises a polymer selected from one or more of the materials commonly used for electronics packaging” and includes those mentioned above [0057]. Glatkowski also teaches that specific application will dictate which polymer matrix is used [0056]. It is well known in the art that thermoplastic resins (such as polycarbonate) are often employed in a wide range of applications, including coatings and numerous moldings and articles. For many of these applications, superior properties in heat resistance, mechanical/chemical stability, and dimensional stability are required. Accordingly, a curable resin (such as urethanes, epoxies, polyimides) is usually incorporated in the thermoplastic resin to improve those properties. Equipped with that knowledge and in light of the suggestions made by Glatkowski, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have employed a composite resin made by dispersing a curable resin in one or more thermoplastic resins and incorporated said composite resin in the nanocomposite dielectric taught by Glatkowski to prepare electronics components that are heat resistant and have superior mechanical, chemical, and dimensional stability.

Response to Arguments

12. Applicant's arguments filed 12/08/2008 have been fully considered but they are not persuasive.

13. First, the applicant alleges that there is no motivation to combine Glatkowski and Matsui (p. 12). The motivations for such combination are set forth above. Glatkowski does not teach away from using the carbon nanotubes taught in Matsui and Nishino. In fact, Glatkowski looks for carbon nanotubes with good electrical property [0062]. Glatkowski also acknowledges the desired properties of carbon nanotubes, including electrical properties, thermal properties, and extremely high mechanical strength [0060]. The nanotubes taught by Matsui and Nishino can be produced in large quantity, suggesting that these are more cost-effective than conventional single-walled and multi-walled carbon nanotubes. Low cost is a motivation to one of ordinary skill in the art whether or not it is mentioned in Glatkowski. Applicant alleges that the carbon nanotubes disclosed in Matsui would not work if incorporated in a resin such as taught by Glatkowski (. 13, 3rd to last paragraph). This is not true since, for the purpose of incorporation in a resin, conventional CNTs or those taught in Matsui can be said to be equivalent and can be used interchangeably as evidenced from the fact that the applicant has no preference for one over the other (Specification, pages 7-8 and 15). If anything, the carbon nanotubes taught by Matsui and Nishino are BETTER than conventional carbon nanotubes in terms of ease of their incorporation in a resin as disclosed by the applicant (Specification, p. 15, lines 13-20).

14. Second, applicant's allegation that the instant invention has unexpected results (i.e., use of very low concentration of carbon nanotubes in a resin does not increase tanδ) that are not taught by the prior art is not true as Glatkowski repeatedly teaches that the filler (i.e., carbon nanotubes) should be incorporated in a resin in an amount below its percolation threshold in order to minimize dielectric loss (i.e., to have low tanδ). Further, the concentration and the length of the carbon nanotubes should be controlled for use at different frequencies [0036, 0068, 0084, 0104-0109].

15. Finally, applicant alleges that Nishino is not combinable with Glatkowski because Nishino does not teach or suggest that addition of a small amount of the disclosed carbon nanotubes in a resin would keep tanδ low and that, since Nishino teaches that electroconductivity is increased, tanδ is expected to increase (p. 16, first paragraph). Motivations for combining Glatkowski and Nishino have been set forth above. Factors affecting tanδ have more to do with the concentration of the carbon nanotubes than with whether the carbon nanotubes are conventional ones or those taught by Nishino. As mentioned, Glatkowski teaches methods of controlling tanδ. In fact, the high electrical conductivity of the carbon nanotubes disclosed by Nishino is another motivation for their incorporation in the dielectric material taught by Glatkowski since Glatkowski prefers carbon nanotubes that have high electrical conductivity as mentioned above.

Conclusion

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vu Nguyen whose telephone number is (571)270-5454. The examiner can normally be reached on M-F 7:30-5:00 (Alternating Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Vu Nguyen
Examiner
Art Unit 1796

/David Wu/
Supervisory Patent Examiner, Art Unit 1796